

# SUITABILITY OF DURUM WHEAT VARIETIES FOR THE PRODUCTION OF DOUGHNUTS

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Two durum wheat varieties D-97 and WDK-85 and one bread wheat variety Inqilab-91 were tested to assess the suitability for the production of doughnuts. Doughnuts are fermented bakery products, fried in hot oil/fat to form sweet snacks. Doughnuts of good quality has a dry crust and are crispy. The chemical characteristics of wheat grains such as moisture, ash, protein, fat and fiber contents varied from 8.90 to 9.45%, 1.40 to 1.55%, 11.50 to 12.25%, 1.14 to 1.81% and 2.32 to 2.73%, whereas, the chemical characteristics of patent flours varied from 13.31 to 14.95%, 0.35 to 0.54%, 11.02 to 11.81%, 0.57 to 0.96% and 0.36 to 0.41%, respectively. The interactions were found to be highly significant in case of crumb and overall acceptability. Thus, it is concluded that doughnuts made from D-97 are more acceptable to the consumers as they obtained maximum score followed by Inqilab-91. Therefore, this study indicated that good quality doughnuts could be prepared from durum wheat varieties.

**Key words:** Durum wheat, Doughnuts, Bakery.

## Introduction

There are three major species of wheat. Among them, common wheat is a staple food for the people of Pakistan. *Triticum durum*, tetraploid wheat is successfully being used for baking bread in Middle East (William *et al* 1984).

Doughnuts are fermented bakery products fried in hot oil or fat to form sweet snacks. Doughnuts can be made from pre-mixed and fermented dough at the point of sale with considerably less capital outlay than other equivalent baked products (Booth 1990). These are served quite extensively in hotels, restaurants and snack bars in many countries of the world. The ingredients used to make doughnuts include flour, sugar, eggs, shortening, milk, baking powder, yeast, salt and flavoring agents (Anon 1979). The heating of fat in the frying process not only serves as an energy-transferring medium to doughnuts but also enters into them and becomes an intrinsic part of the finished products (Pylar 1988).

During frying, heat is transferred from the fat to the raw doughnuts better rapidly. The doughnuts become golden brown in color on frying and absorb shortening. This imparts proper eating qualities.

For the preparation of good quality doughnuts, the principles that should be followed are selection of good mixes i.e. stored at room temperature in a dry location, addition of correct water level i.e. 37-40%, proper dough handling and mixing, proper make up before frying, proper frying i.e. 193-199°C for 45 sec on each side, proper care of shortening and finishing (Lawson 1995).

Quality of all the yeast-raised doughnuts is influenced by the grade of flour used in the fermentation of mixes. Flours having protein in the range of 12.25 - 12.80% are considered ideal for doughnuts preparation (Matz 1959).

Fat absorption during frying of doughnuts is considered ideal, it ranges from 2.5 - 3.5 oz per dozen of yeast leavened doughnuts weighing from 18-19 oz per dozen raw weight. Richer formulas generally absorb more shortening (Matz 1991).

This project is designed to assess the suitability of durum wheat varieties (*Triticum durum*) for the preparation of doughnuts.

## Materials and Methods

Three wheat varieties were obtained from Ayub Agricultural Research Institute, Faisalabad. Two durum wheat varieties, D-97, Wdk-85 and one bread wheat variety namely Inqilab-91 were included in this study. Thousand-kernel weight and test-weight were determined according to the methods given in AACC (1983). Chemical tests including moisture, ash, crude protein, crude fat and crude fiber contents were carried out both for whole wheat and patent flours according to the methods given in AACC (1983).

Wet and dry gluten, pelshenke values and rheological studies (*Farinographic, mixographic* and *amylographic* studies) were conducted according to methods as described in AACC (1983). Doughnuts were prepared according to the method as described by Bhatti (1998).

Weight-volume ratio of the fried doughnuts was carried out by using rapeseed displacement method (Mallock and Cook 1930).

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Sensory evaluation of doughnuts was carried out by a panel of six judges selected from the Department of Food Technology, University of Agriculture, Faisalabad, to evaluate the color, flavor, texture, taste and overall acceptability on 9-point hedonic scale at an interval of 6 and 24 h after the preparation and storage at ambient temperature (Land and Shepherd 1988).

The data were subjected to statistical analysis by applying Randomized Complete Block Design (RCBD), (Steel and Torrie 1984).

## Results and Discussion

The physical tests revealed the highest thousand-kernel weight and test-weight in case of D-97 (Table 1). The results regarding test-weight fall within the limits of range as reported by Paliwal and Singh (1985). The chemical characteristics such as moisture, ash, crude fat, crude protein and crude fiber contents, varied significantly due to the difference in wheat varieties.

**Table 1**  
1000-Kernel weight and test-weight of wheat varieties

S.No.	Varieties	1000-Kernel weight (g)	Test-weight (kg/hl)
1.	D-97	55.90	79.10
2.	Wdk-85	38.30	75.13
3.	Inqlab-91	44.15	77.23

**Table 2**  
Pelshenke values and wet and dry gluten content of different wheat varieties

S.No.	Varieties	Pelshenke values	Wet gluten (%)	Dry gluten (%)
1.	D-97	125	31.10	10.13
2.	Wdk-85	95	29.75	9.92
3.	Inqlab-91	165	30.41	10.01

The moisture content varied from 8.90 - 9.45%, ash content from 1.40 to 1.55%, crude protein from 11.50 - 12.25%, crude fat from 1.14 - 1.81% and crude fiber from 2.32 - 2.73% in case of wheat flour whereas, in case of patent flour, moisture content varied from 13.31 to 14.95%, ash content 0.35 to 0.54%, crude protein from 11.02 to 11.81%, crude fat from 0.57 to 0.95% and crude fiber 0.36 to 0.41% (Table 3). The results are corroborated with the findings of Bhatti (1998).

The pelshenke values were found to be highest in case of Inqlab-91 but wet and dry gluten contents found to be highest in case of D-97 (Table 2). The values for wet and dry gluten are quite within the range as reported by Huebner (1970), who stated that dry gluten varied from 9 to 11% in hard wheat. Bakhshi and Bains (1987) reported that durum and bread wheat contained 11.0 and 9.8% dry gluten, respectively. Paliwal and Singh (1985) reported that Pelshenke values ranged from 82-133 min between 13 Indian wheat varieties.

Rheological studies were conducted on the three wheat varieties (Table 4). Durum D-97 showed the highest water absorption, dough development time, dough stability, departure time and the lowest mixing tolerance and softening of dough. This might be due to the good quality of protein. Bakhshi and Bains (1987) determined the physiochemical, rheological and end use characteristics of durum and bread wheat. Dough stability and softening of dough for durum and bread wheat flours were 17 and 8 min and 10 and 50 BU, respectively. There was no difference in the viscosities of the varieties but D-97 (1.75 min) showed the highest mixing time as depicted by mixograph.

Doughnuts prepared from different wheat varieties were subjected to sensory evaluation for color of crust, color of crumb, flavor, texture and overall acceptability. Analysis of variance technique was used to analyze the data pertaining to these characteristics. The results are given in the Table 5.

The results pertaining to weight, volume and weight-volume ratio are given in Table 6. The average values of weight, volume

**Table 3**  
Chemical composition of whole wheat and patent flours

Composition	Whole wheat flour			Patent flour		
	D-97	Wdk-85	Inq-91	D-97	Wdk-85	Inq-91
Moisture (%)	9.45	8.90	8.95	14.65	14.95	13.31
Ash (%)	1.45	1.55	1.40	0.51	0.54	0.35
Crude Protein (%)	11.95	11.50	12.25	11.13	11.02	11.81
Crude fat (%)	1.16	1.14	1.81	0.96	0.90	0.57
Crude fiber (%)	2.32	2.39	2.73	0.41	0.39	0.36

**Table 4**  
Rheological characteristics of patent flour

Varieties	Farino graph							Amylograph	Mixograph	
	WA(%)	AT (Min)	DDT (Min)	DS (Min)	DT (Min)	MIT (BU)	SOD (BU)	BU	MT (Min)	PH %
D-97	70.92	1.00	6.25	17	18	10	10	1500	1.75	64
Wdk-85	73.65	1.00	1.50	02	03	110	140	1500	1.40	62
Inqlab-91	62.20	0.75	4.25	08	09	50	80	1500	1.62	82

WA = Water absorption; AT = Arrival time; DDT = Dough development time; DS = Dough stability; DT = Departure time; MTI = Mixing tolerance index; SOD = Softening of dough; =; MT = Mixing tolerance; PH = Peak height

**Table 5**  
Sensory evaluation of doughnuts prepared from different wheat varieties

Characteristics	Inqlab-91	D-97	Wdk-85
Color of crust	6.50a	8.00a	5.70b
Color of crumb	6.05a	7.60a	5.90b
Taste	5.60b	7.60a	5.45b
Flavor	5.60b	7.55a	5.50b
Texture	5.60b	7.85a	5.60b
Overall adaptability	5.75b	7.65a	5.90b

**Table 6**  
Volume, weight and weight to volume ratio of doughnuts

Varieties	Volume (CC)	Weight (g)	Weight : volume
D-97	87.50	44.85	1.95
Wdk-85	65.00	45.00	1.44
Inqlab-91	77.50	45.16	1.71

and weight to volume ratio showed that there was a mild difference in weights of doughnut. In case of volume, D-97 got the highest volume followed by Inqlab-91 and Wdk-85. This showed that D-97 had more gas retention power among other two.

## Conclusion

The doughnuts prepared from D-97 got the highest scores in all so it was proved that doughnuts prepared from D-97 were of good quality than those of prepared from other varieties. The doughnuts prepared from Inqlab-91 achieved the second position while Wdk-85 was rated third. This study indicated that good quality doughnuts could be prepared from durum wheat varieties.

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